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Pumphandle Lecture – 2009

David Heymann

“When Nature turns cook:
The epidemiologist’s feast”


Defibrillator
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When nature turns cook:
an epidemiological feast
Dr David Heymann


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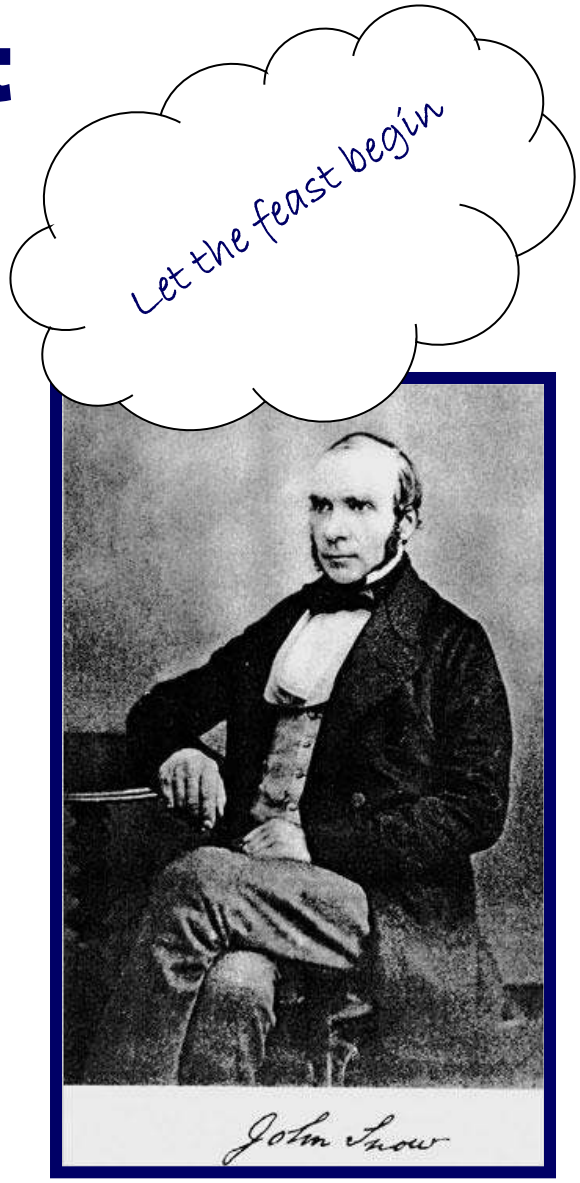
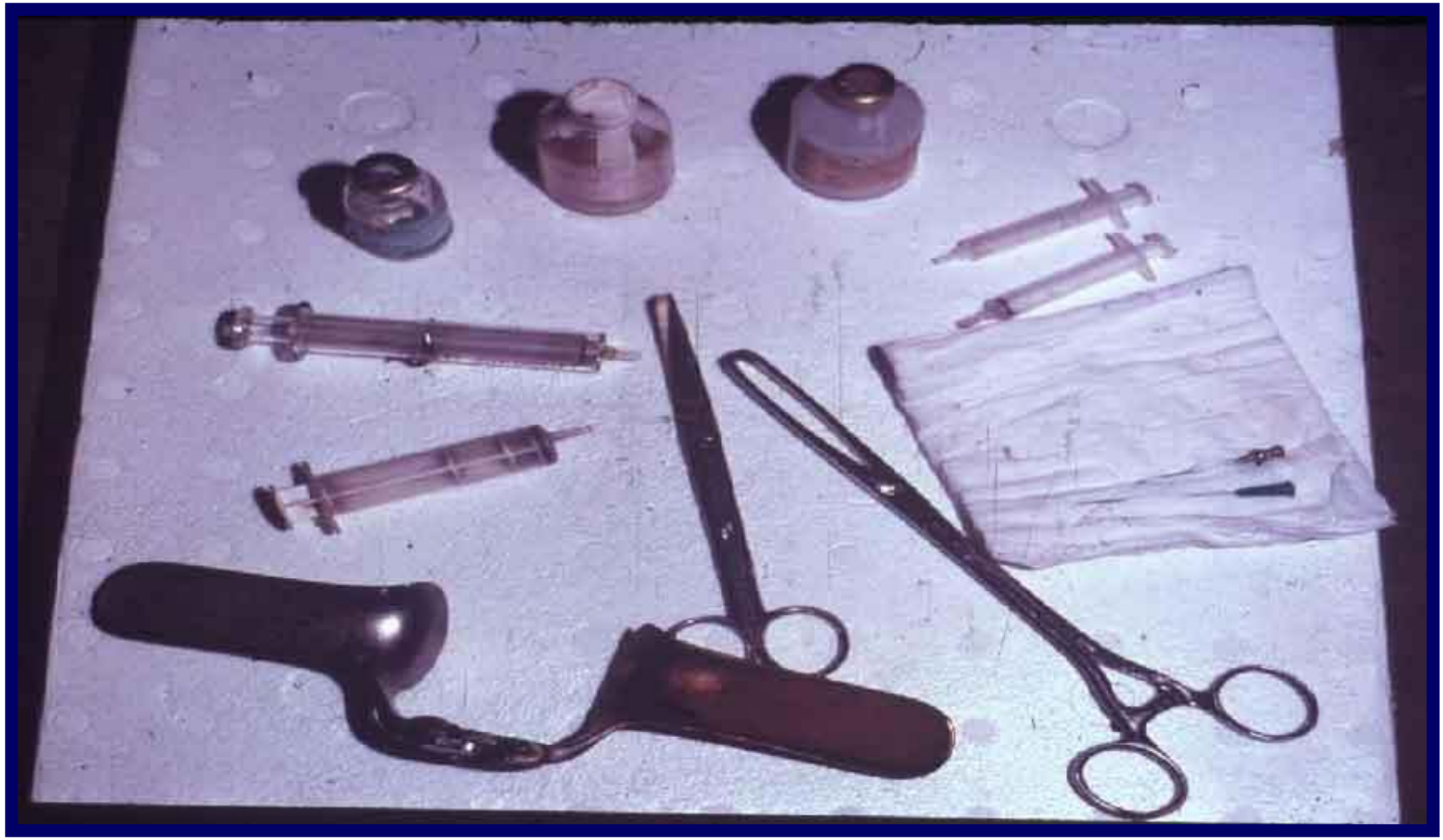
When nature turns cook: the epidemiologist's feast



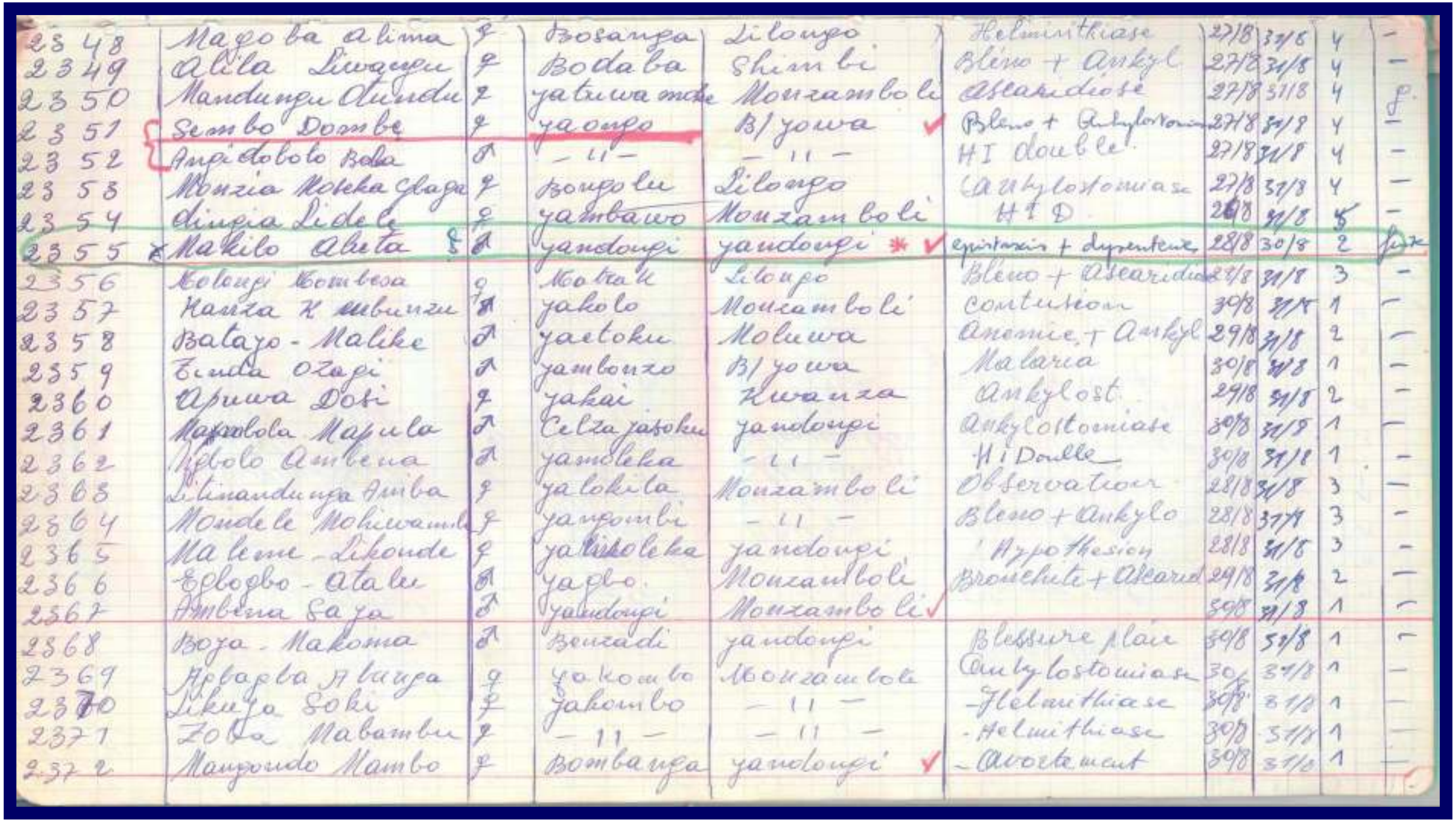
Yambuku Mission Hospital, DRC (Zaire), 1976

Hospital Implements, Yambuku, 1976



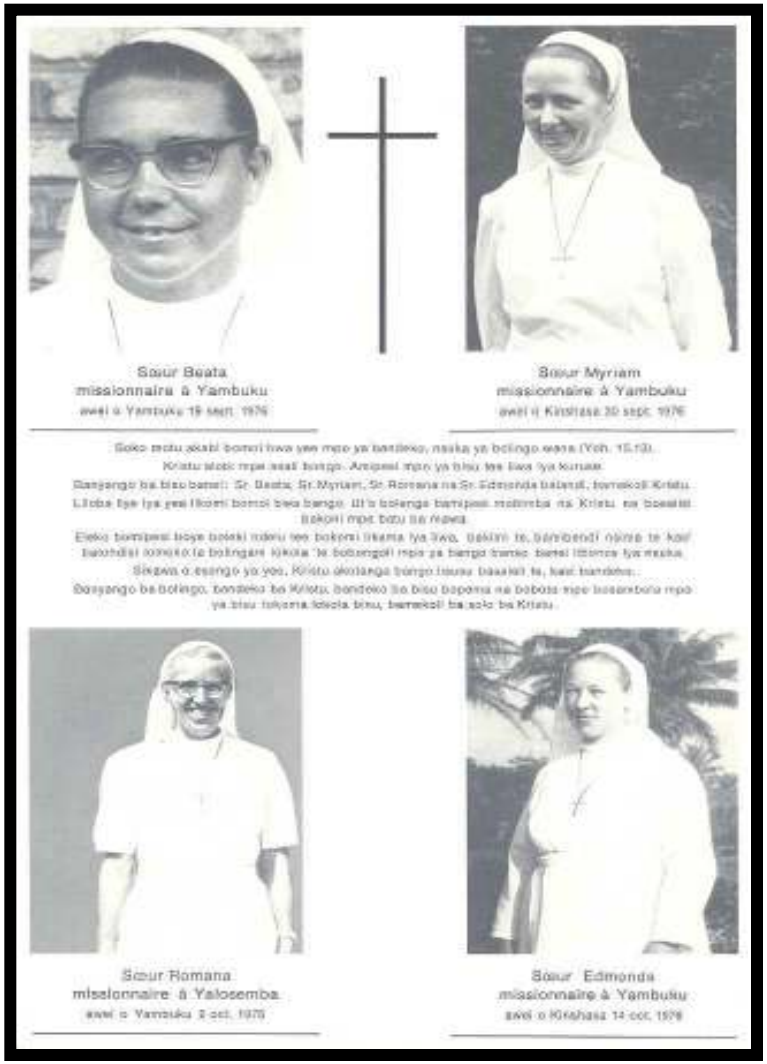
Animal market, near Yambuku, 1976

Patient record, outpatient department, Zambuku Hospital, DRC (Zaire), August 1976



2348	Magoba Alima	♀	Bosanga	Lilongo	Helminthiase	27/8	31/8	4	–
2349	Alila Liwaya	♀	Bodaba	Shimbi	Bléno + Ankyl	27/8	31/8	4	–
2350	Mandunga Aunda	♀	yatuwa mde	Mouzamboli	Ascaridiose	27/8	31/8	4	♀
2351	Sembo Dombe	♀	yaongo	B/ yowa	Bléno + Ankylostomiase	27/8	31/8	4	–
2352	Angidobolo Bola	♂	– " –	– " –	HI double	27/8	31/8	4	–
2353	Mouzia Moteka Gbaga	♀	Bongolu	Lilongo	Ankylostomiase	27/8	31/8	4	–
2354	dingia Lidele	♀	yambawo	Mouzamboli	H I D	28/8	31/8	3	–
2355	Makilo Aleta	♂	yandongi	yandongi	épistaxis + dysenterie	28/8	30/8	2	fixe
2356	Kolongi Bombesa	♀	Mobrak	Lilongo	Bléno + Ascaridiase	28/8	31/8	3	–
2357	Hanza K mbunzu	♂	yakolo	Mouzamboli	contusion	30/8	31/8	1	–
2358	Balayo - Malike	♂	yaetoku	Moluwa	anémie + Ankyl	29/8	31/8	2	–
2359	Einda Ozagi	♂	yambonzo	B/ yowa	Malaria	30/8	31/8	1	–
2360	Apuwa Doti	♀	yakai	Kwanza	Ankylost	29/8	31/8	2	–
2361	Magbolola Mapula	♂	Celza yasoku	yandongi	Ankylostomiase	30/8	31/8	1	–
2362	Kbolo Ambena	♂	yamoleka	– " –	H I Double	30/8	31/8	1	–
2363	Litinandunga Amba	♀	yalokila	Mouzamboli	Observation	28/8	31/8	3	–
2364	Mondele Mokiwambi	♀	yangombi	– " –	Bléno + Ankylo	28/8	31/8	3	–
2365	Maleme Likonde	♀	yakoleka	yandongi	Hypotension	28/8	31/8	3	–
2366	Egbogbo - Atalu	♂	yapbo	Mouzamboli	Bronchite + Ascarid	29/8	31/8	2	–
2367	Ambena Saza	♂	yalandongi	Mouzamboli		30/8	31/8	1	–
2368	Boza Makoma	♂	Benzadi	yandongi	Blessure plaie	30/8	31/8	1	–
2369	Agbagba Alunga	♀	yakombo	Mouzamboli	Ankylostomiase	30/8	31/8	1	–
2370	Likuja Soki	♀	Jakombo	– " –	Helminthiase	30/8	31/8	1	–
2371	Zobia Mabambu	♀	– " –	– " –	Helminthiase	30/8	31/8	1	–
2372	Mangondo Mambo	♀	Bombanga	yandongi	Avortement	30/8	31/8	1	–

Deceased health workers, Yambuku Mission Hospital, Zaire, 1976



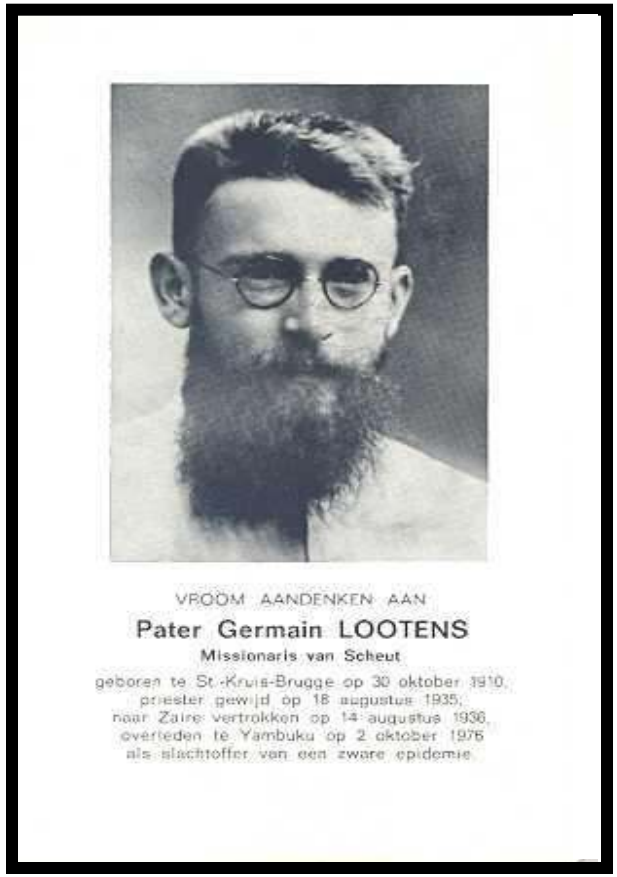
Sœur Beata
missionnaire à Yambuku
awel o Yambuku 19 sept. 1976

Sœur Myriam
missionnaire à Yambuku
awel o Kinshasa 30 sept. 1976

Soko motu akobi bomoi liwa yee mpo ya bandeko, nasika ya bolingo wana (Yoh. 15.13).
Kristu otiki mpe asali bongo. Amipesi mpo ya biso tee liwa lya kumak.
Bonyango ba biso bamel: Sr. Beata, Sr.Myriam, Sr. Romana na Sr. Edmonda balandi, bamekoli Kristu.
Libota lya yaa liboni bomoi biwa bango. Ut'o bolenga bamipesi motindo na Kristu na boselisi
bakoni mpe botu ba mawa.
Eleko bamipesi boye boteki ndenu wee bokoni likama lya liwa. Bakim te, bandendi ngima te kasi
bandimi komeko te bolingani kikoka te bolongoli mpo ya biango bango. Bamel liboma lya maaka.
Sikawa o esengo ya yoo, Kristu akolanga bango lousu biaaleli te, kasi bandeko.
Bonyango ba bolingo, bandeko ba Kristu, bandeko ba biso bapema na bobota mpo bosambolu mpo
ya biso tokoma bolela biso, bamekoli ba solo ba Kristu.

Sœur Romana
missionnaire à Yalosemba
awel o Yambuku 2 oct. 1976

Sœur Edmonda
missionnaire à Yambuku
awel o Kinshasa 14 oct. 1976



VROOM AANDENKEN AAN

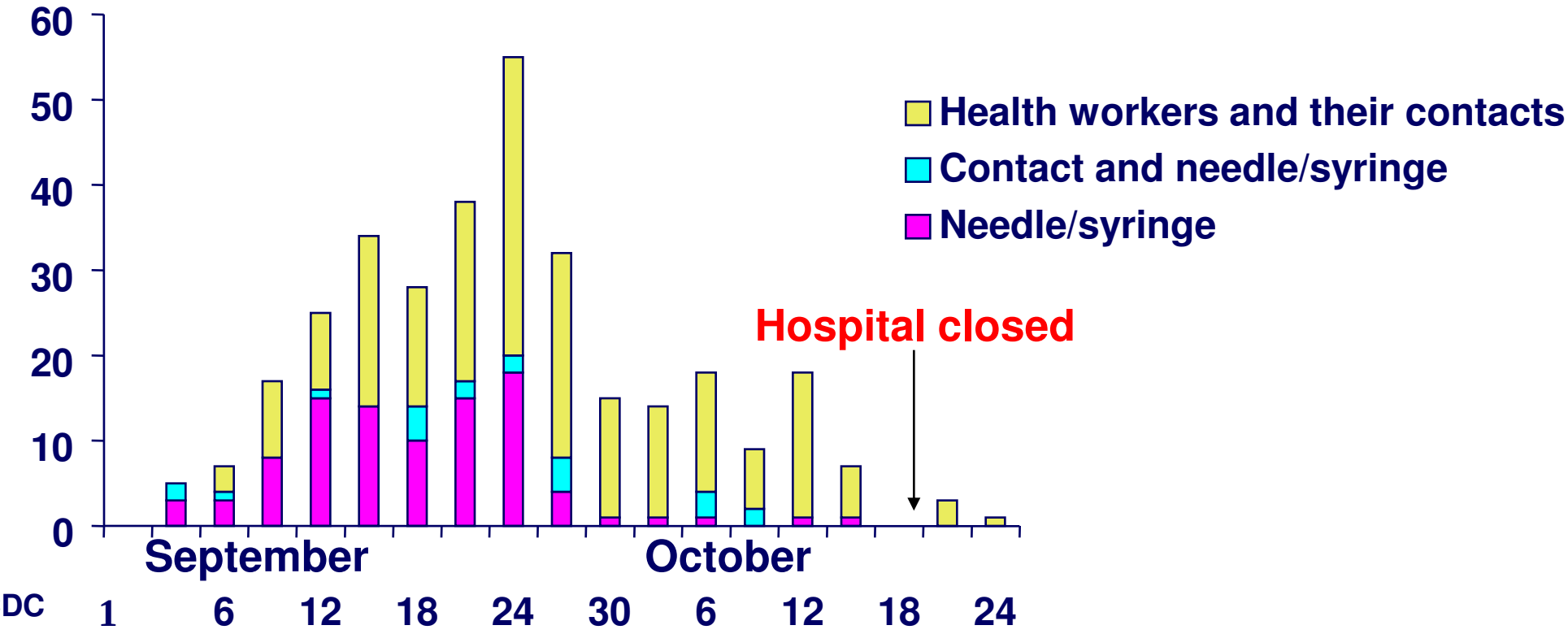
Pater Germain LOOTENS

Missionaris van Scheut

geboren te St.-Kruis-Brugge op 30 oktober 1910,
priester gewijd op 18 augustus 1935,
naar Zaire vertrokken op 14 augustus 1936,
overleden te Yambuku op 2 oktober 1976
als slachtoffer van een zware epidemie.

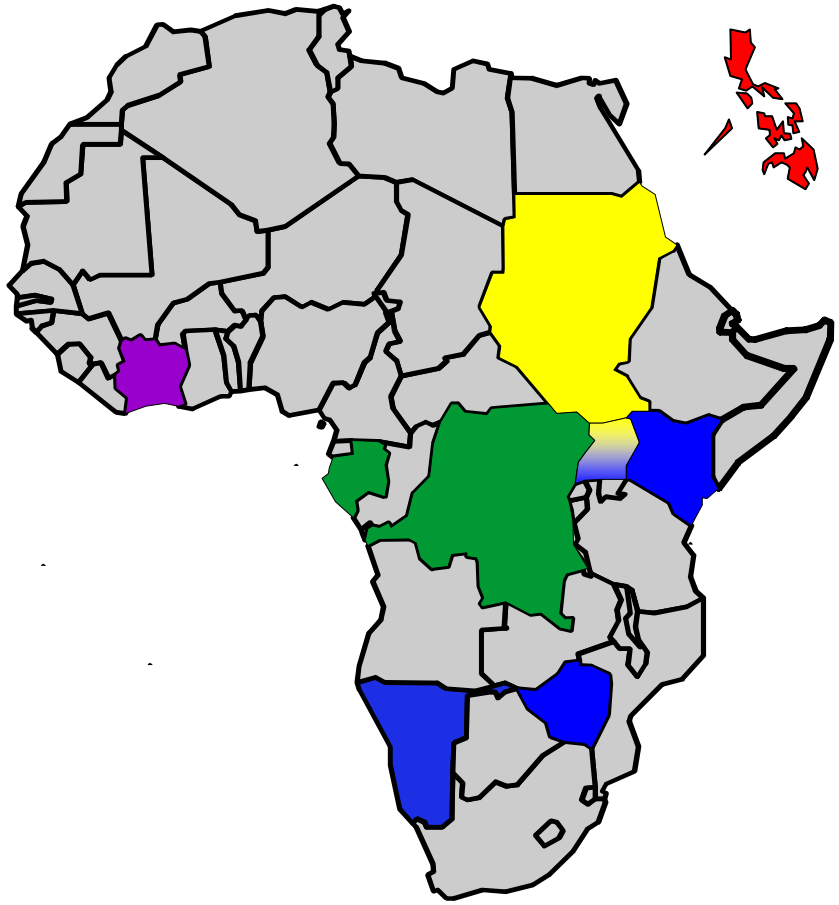
Filoform virus, first identified 1976, CDC (Atlanta) and Porton Down (UK)

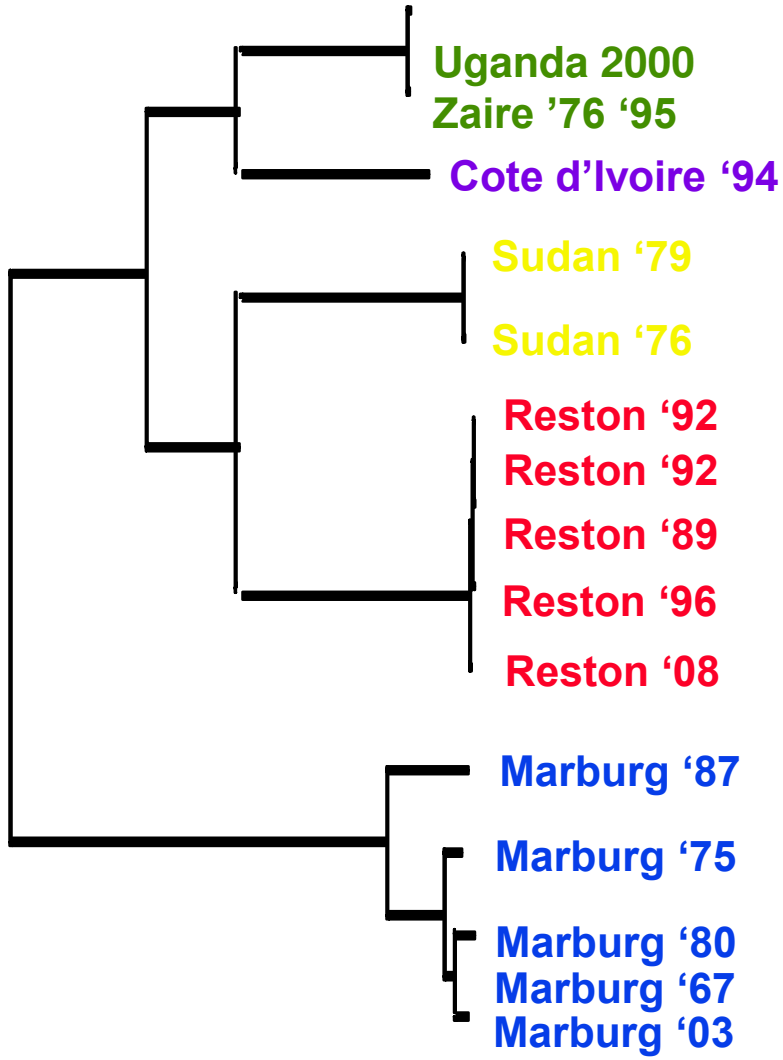
Ebola Haemorrhagic Fever by mode of transmission, Yambuku DRC (Zaire), 1976



Source: CDC

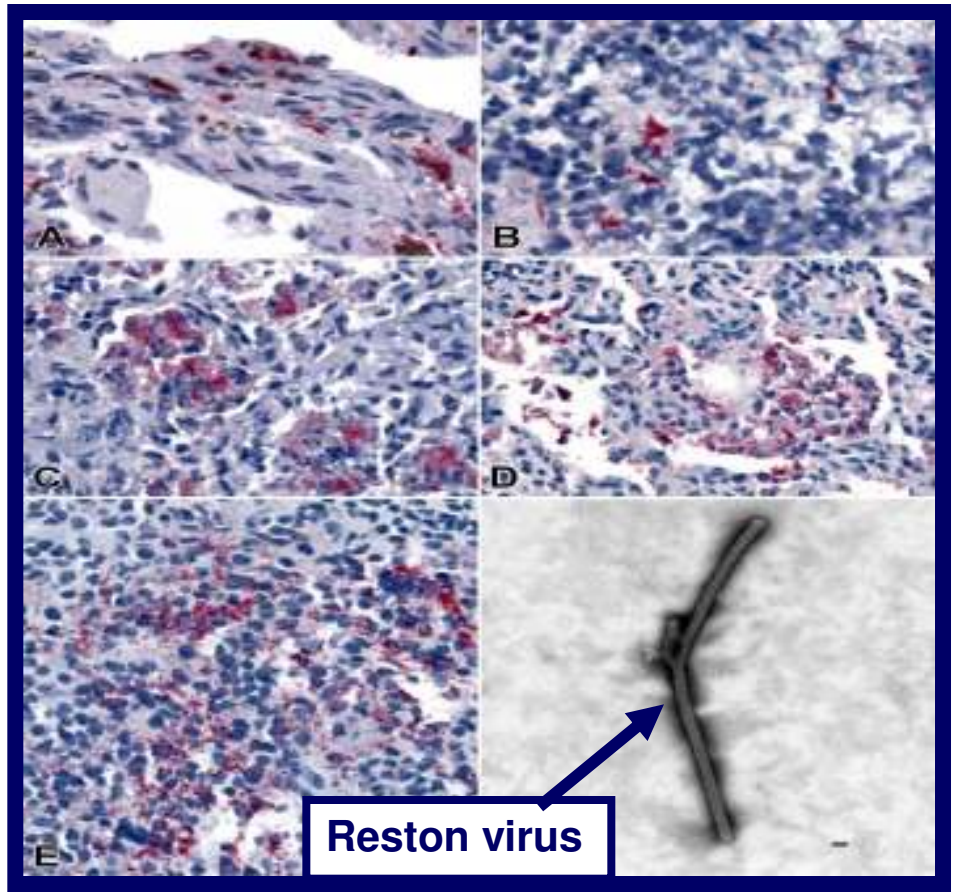
Selected Ebola outbreaks, 1976 - present





Philippines, Porcine Reproductive and Respiratory Syndrome, July 2007 – June2008

outbreak



The ingredients: outbreaks of Ebola haemorrhagic fever

- Sub-standard infection control

- Daily risks to health workers

- Infections at the animal/human interface

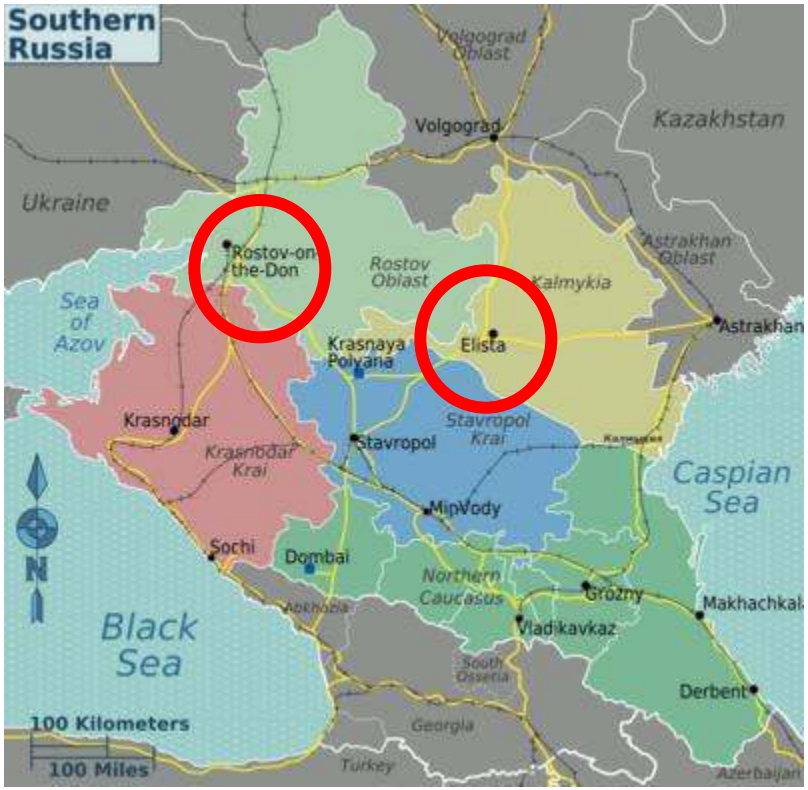
Russian trade ship, 1980s

Paediatric Hospital, Elista, Kalmynk Republic, Russia, 1989

Paediatric AIDS, Elista Hospital, Kalmynk Republic, Russia, 1989

Chain of transmission, nosociomally transmitted HIV, Elista Hospital, 1989

Paediatric HIV infections, Elista (91) and Rostov on the Don (10)



Elista and Rostov-on-Don samples shared common consensus sequences (127 nucleotide sequences) in the V3 region

Nosocomial transmission of HIV, Romania,

Investigation in 1992 provided strong epidemiologic evidence that indiscriminate injections with contaminated needles and syringes were responsible for HIV transmission in orphans

[Romania] A National Commission for 11'000 children infected by HIV in the hospital

May 29, 2007

Podcast: Play now / Download

On May 29, the Romanian Government created an **interdisciplinary commission to investigate the ways of transmission of HIV-AIDS virus to 11'000 children between 1985 and 1992.** For the 8'500 young survivors, today aged from 17 to 20, it is a chance to be recognised as victims of nosocomial infection. "If this fact is recognised by the State, discrimination at school and within social services would decrease", Lucia Stirbu, HIV-AIDS Resource person for Tdh, said.

It is the result of 7 years fight from UNOPA, the Romanian National Union of Organisations of HIV-AIDS affected Persons. Lucia Stirbu, also member of UNOPA, will participate to the works of the Commission..

Lucia Stirbu: The objectives of the Federation were to fight for the access to treatment and social protection because their families are very poor, and to fight that the government recognises the nosocomial way of contamination of these children. Because the Romanian characteristic is that more than half of Europe's positive children are Romanian!

How many children have been infected during this period?

Lucia Stirbu: It was 11'000, and now they are only 8'500 living. And all these children, who are not children now, were infected in

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The ingredients: nosocomial HIV transmission

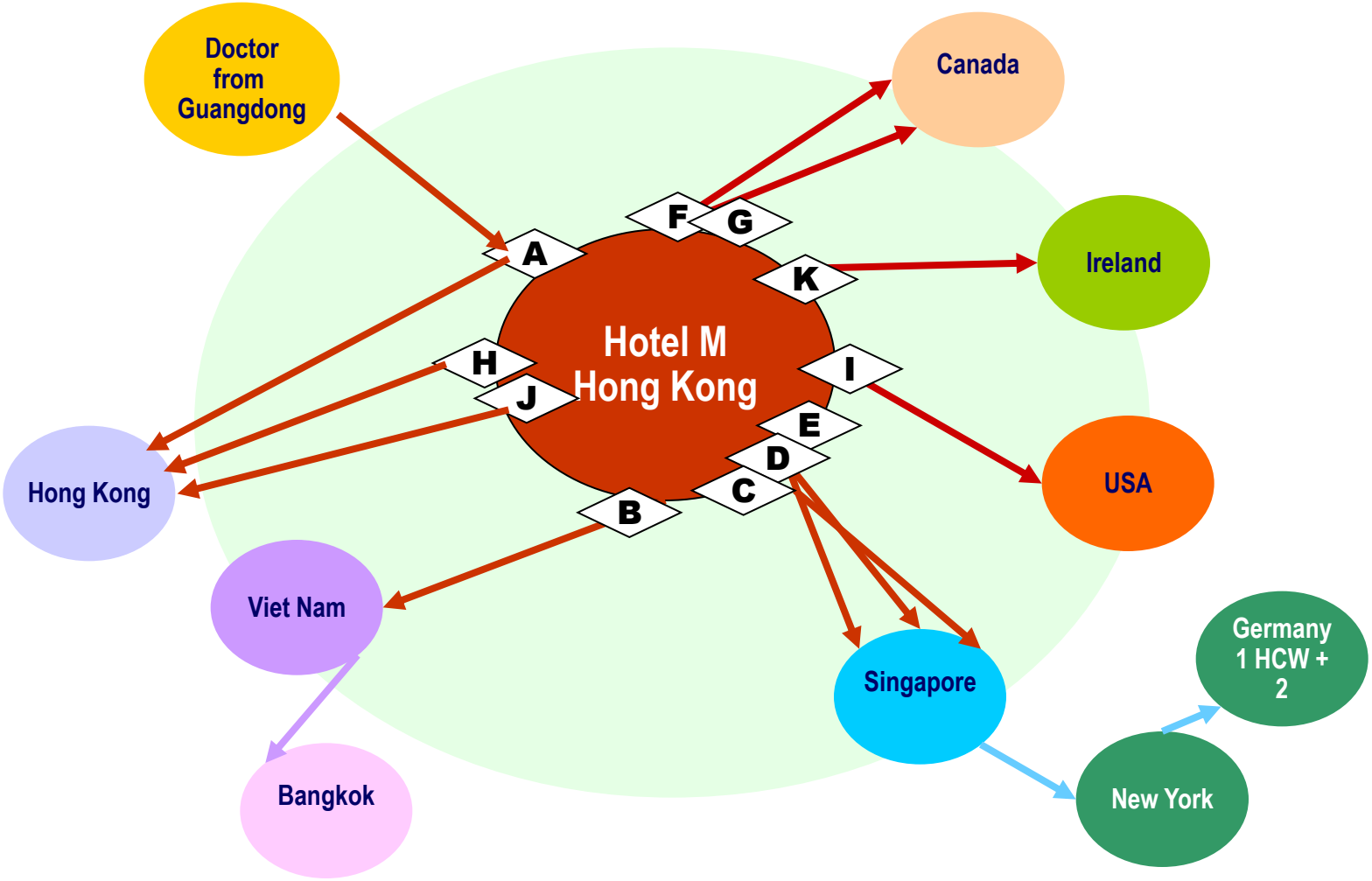
- Risk behaviour/iatrogenic infection (blood, other)
- Sub-standard infection control
- Globalization

Live animal markets, Guangdong Province, 2003

Canton Railway, Hong Kong, 2003

Hong Kong International Airport, 2003

SARS: international spread from Hong Kong, 21 February – 12 March, 2003

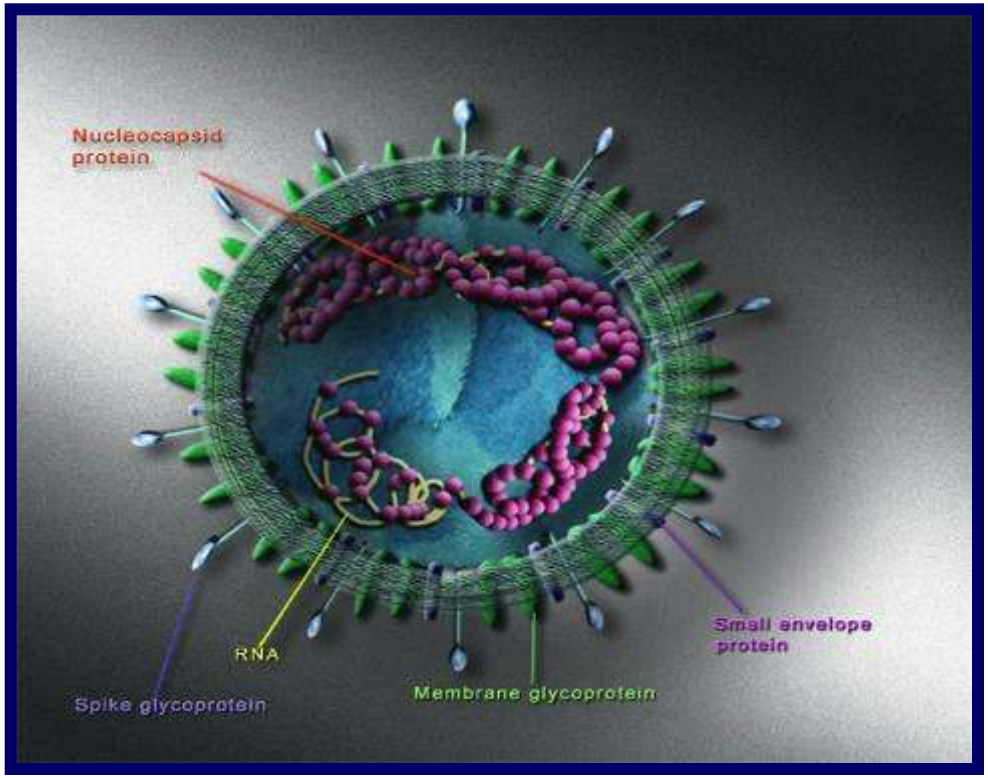


Source:
WHO/CDC

Severe Acute Respiratory virus, 2003

Suspected animals in the chain of transmission

The SARS Coronavirus



SARS, chain of human-to- human transmission, Singapore 2003

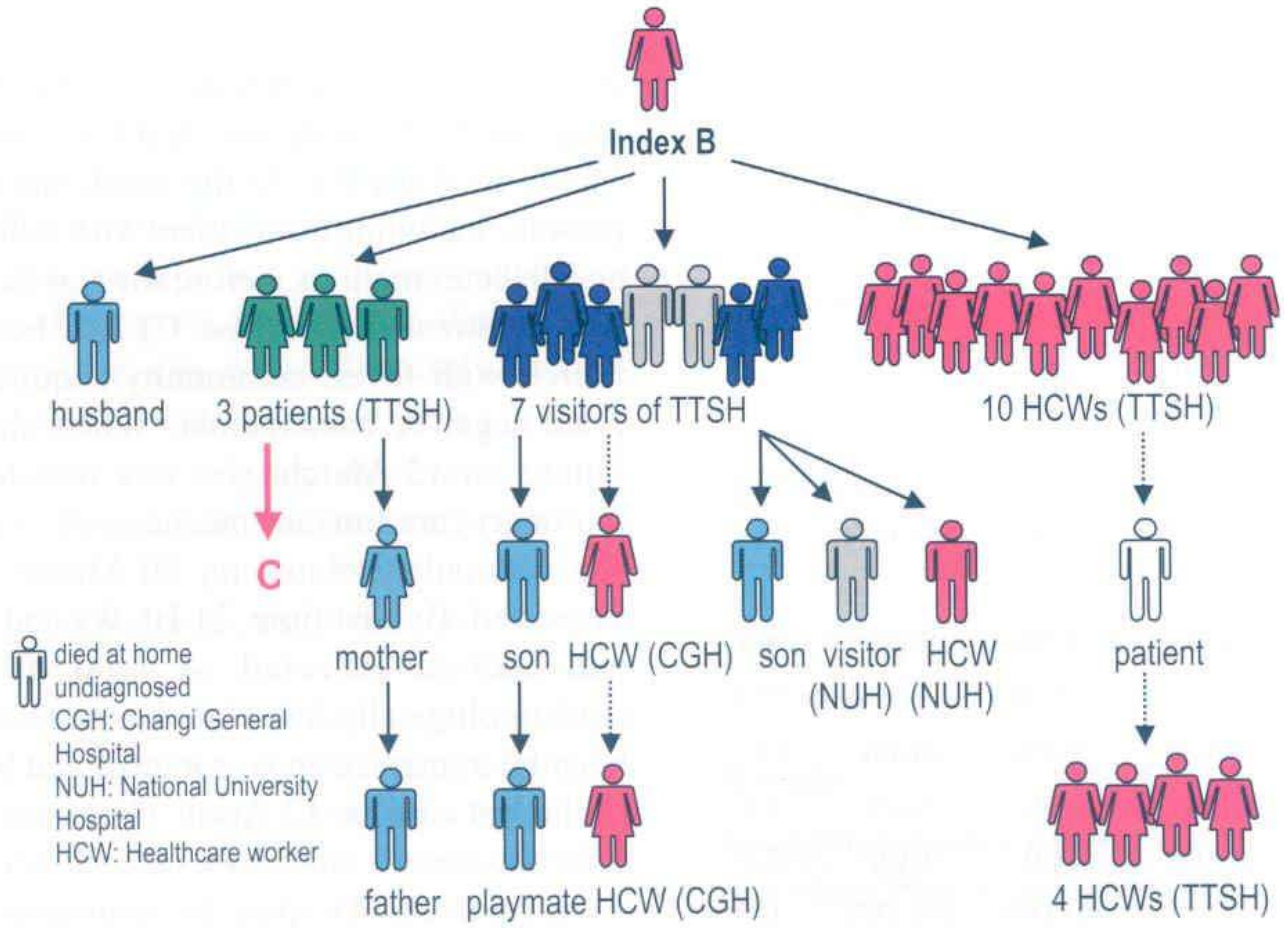
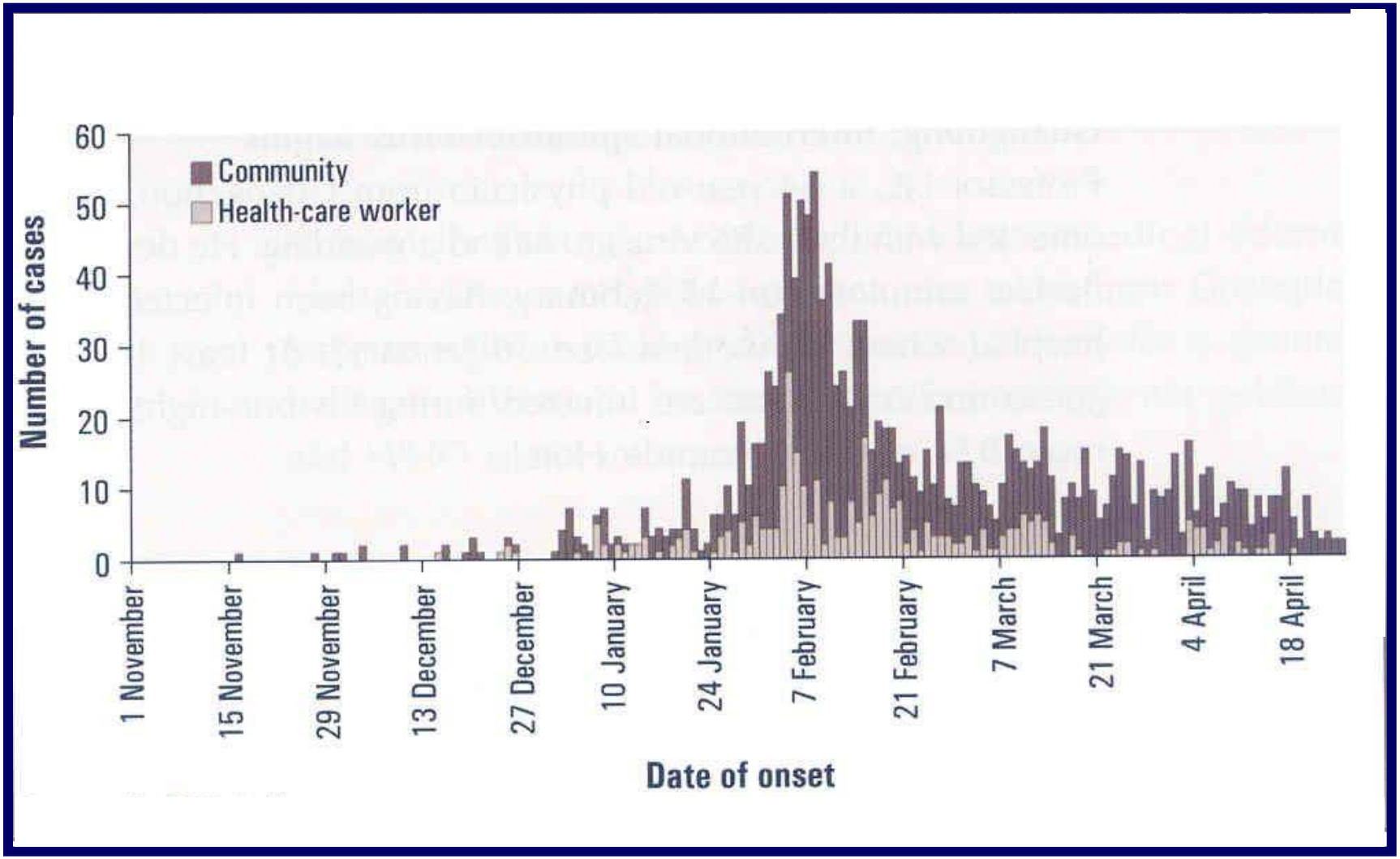
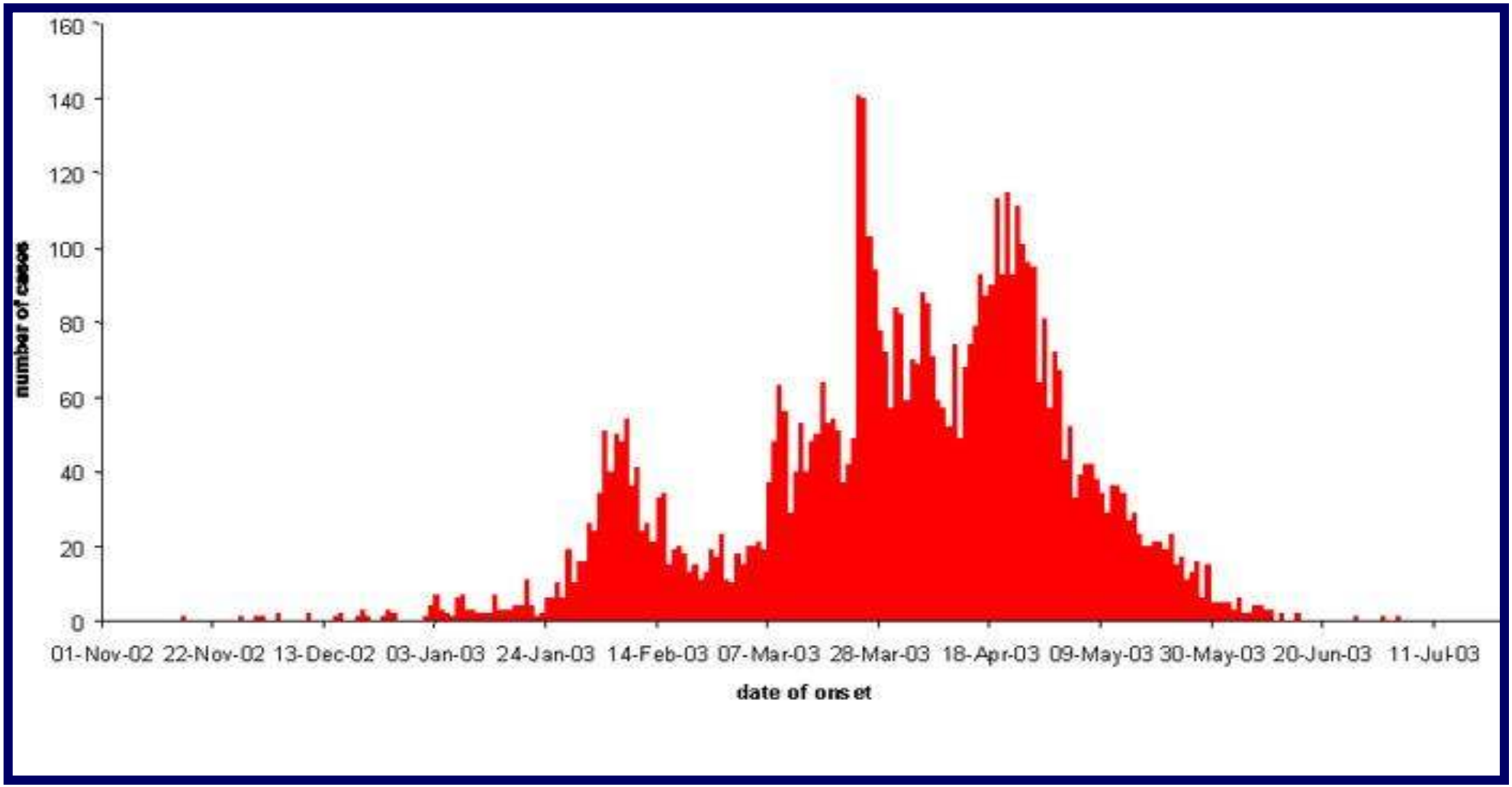


Fig. 2. Chain of transmission of index case B (healthcare worker), Tan Tock Seng Hospital (TTSH).

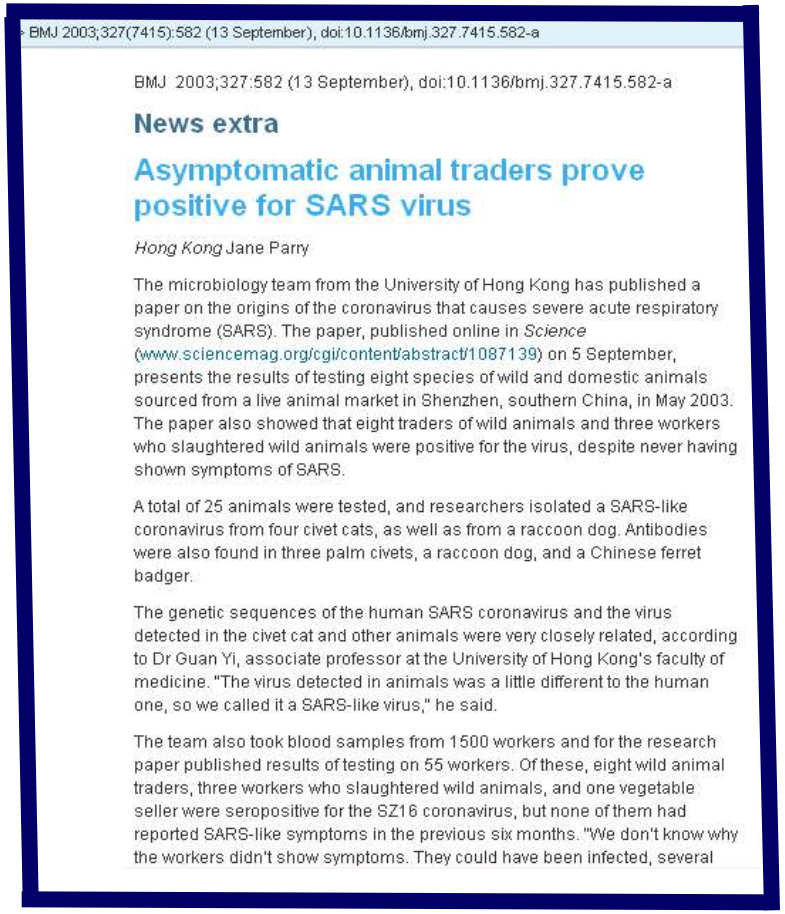
SARS Epidemic curve, China, 2002 - 2003



Probable cases of SARS by date of onset worldwide, 1 March – 27 June 2003



Coronavirus infections, thought to be asymptomatic, animal handlers, China



BMJ 2003;327(7415):582 (13 September), doi:10.1136/bmj.327.7415.582-a

BMJ 2003;327:582 (13 September), doi:10.1136/bmj.327.7415.582-a

News extra

Asymptomatic animal traders prove positive for SARS virus

Hong Kong Jane Parry

The microbiology team from the University of Hong Kong has published a paper on the origins of the coronavirus that causes severe acute respiratory syndrome (SARS). The paper, published online in *Science* (www.sciencemag.org/cgi/content/abstract/1087139) on 5 September, presents the results of testing eight species of wild and domestic animals sourced from a live animal market in Shenzhen, southern China, in May 2003. The paper also showed that eight traders of wild animals and three workers who slaughtered wild animals were positive for the virus, despite never having shown symptoms of SARS.

A total of 25 animals were tested, and researchers isolated a SARS-like coronavirus from four civet cats, as well as from a raccoon dog. Antibodies were also found in three palm civets, a raccoon dog, and a Chinese ferret badger.

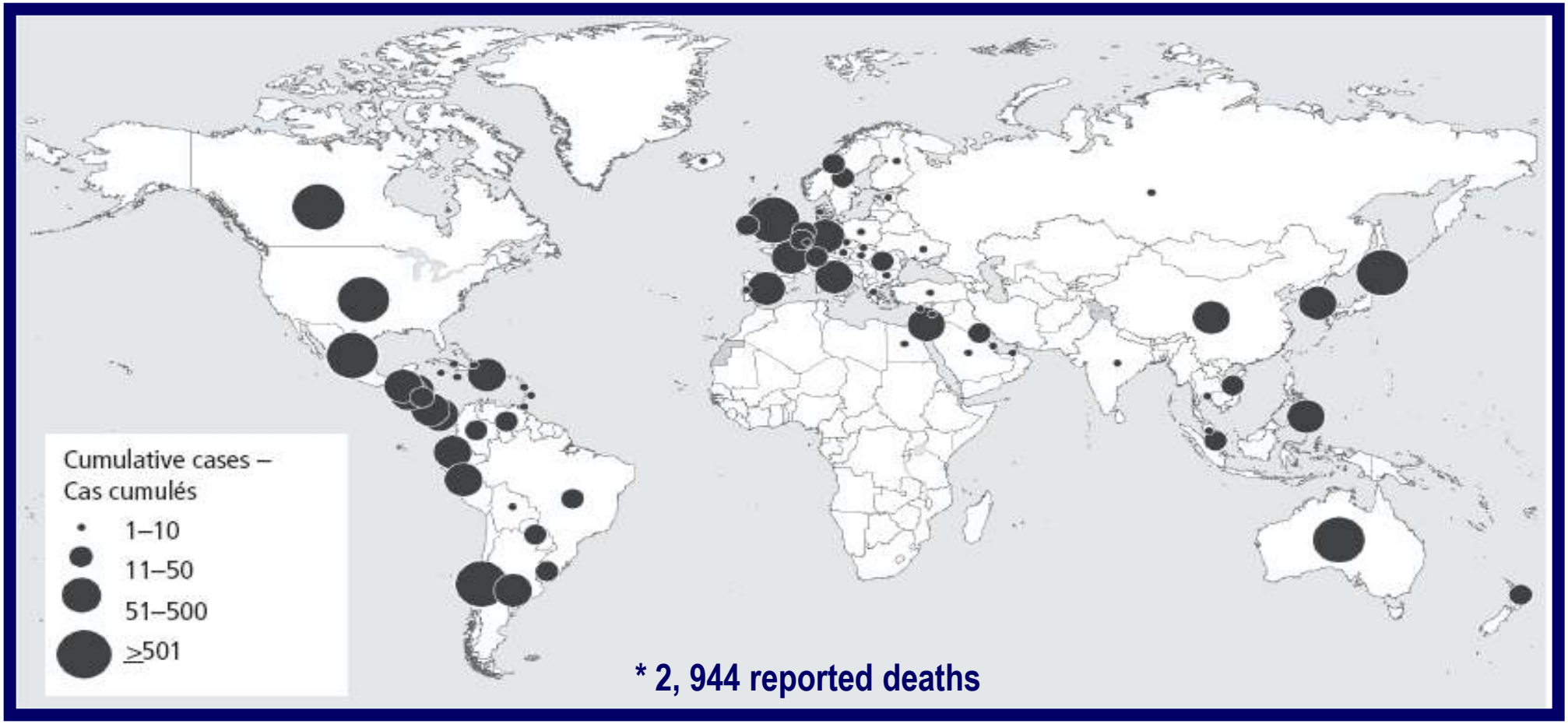
The genetic sequences of the human SARS coronavirus and the virus detected in the civet cat and other animals were very closely related, according to Dr Guan Yi, associate professor at the University of Hong Kong's faculty of medicine. "The virus detected in animals was a little different to the human one, so we called it a SARS-like virus," he said.

The team also took blood samples from 1500 workers and for the research paper published results of testing on 55 workers. Of these, eight wild animal traders, three workers who slaughtered wild animals, and one vegetable seller were seropositive for the SZ16 coronavirus, but none of them had reported SARS-like symptoms in the previous six months. "We don't know why the workers didn't show symptoms. They could have been infected, several

SARS, post-containment cases 2004

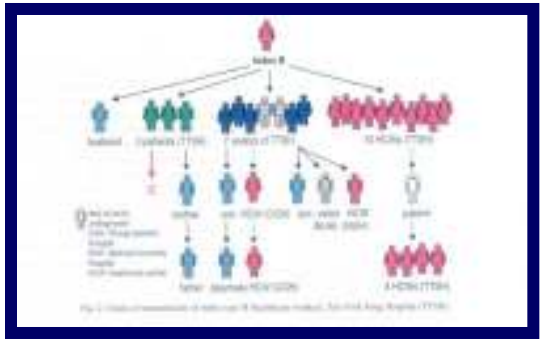
• Singapore	1	laboratory accident 2004	recovered, no human to human transmission
• Taiwan	1	laboratory accident 2004	recovered, no human to human transmission
• China	>4	laboratory accident (s) 2004	serious illness requiring respirator, human to human transmission, deaths

Influenza A(H1N1), cumulative totals of confirmed *cases, 1 September 2009



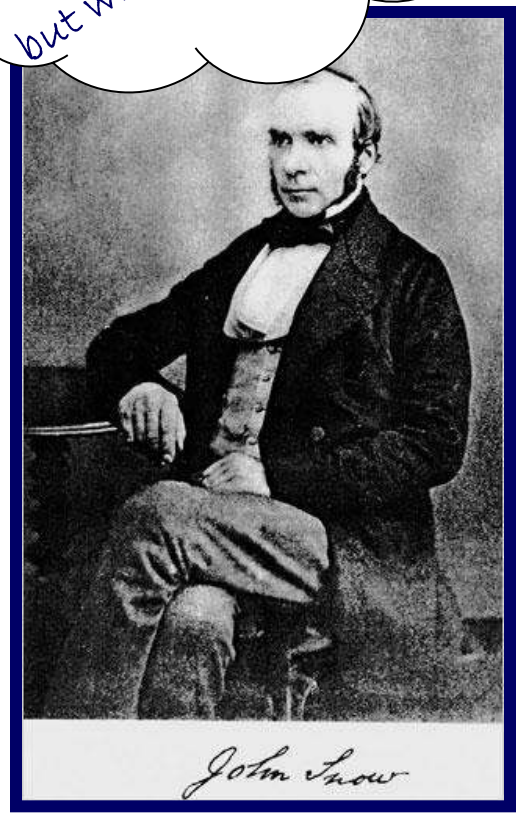
The ingredients: outbreaks such as Severe Acute Respiratory Syndrome (SARS)

- Infections at animal/human interface
- Health-workers as entry points to the community
- Globalization

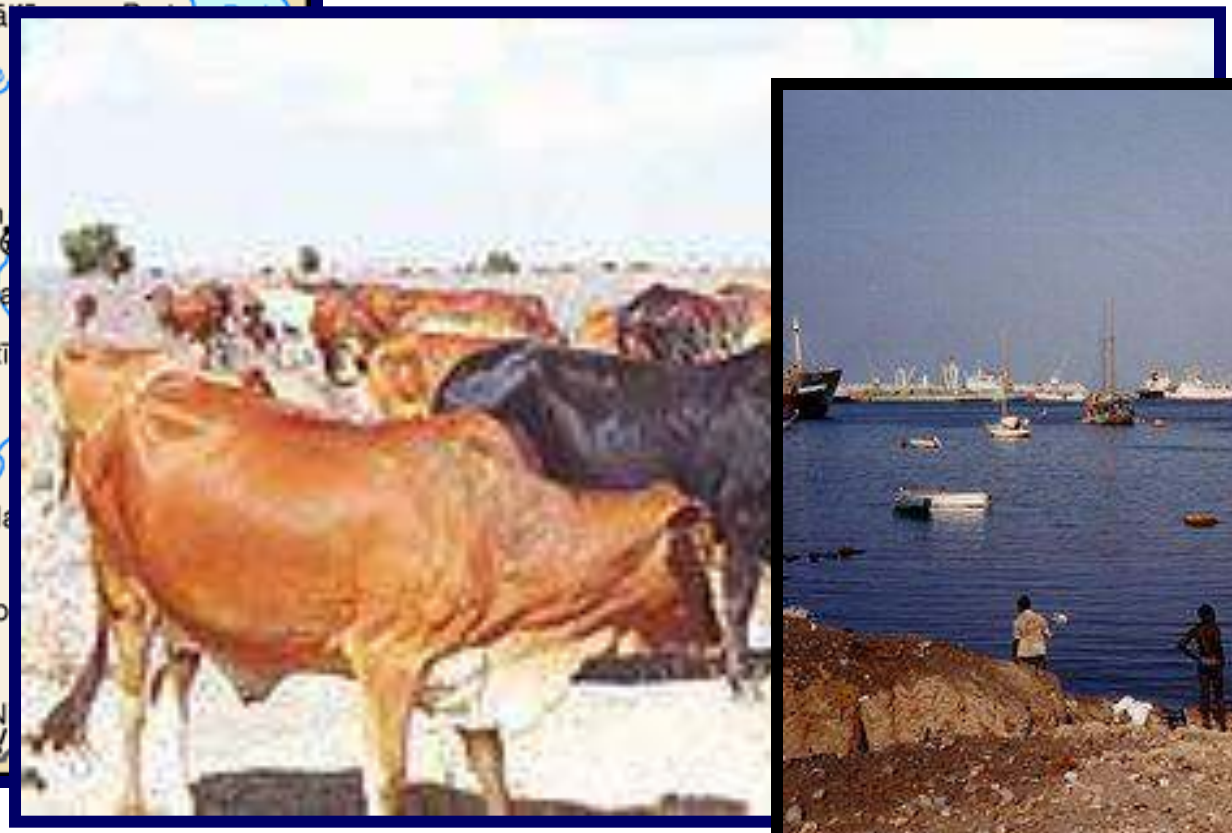


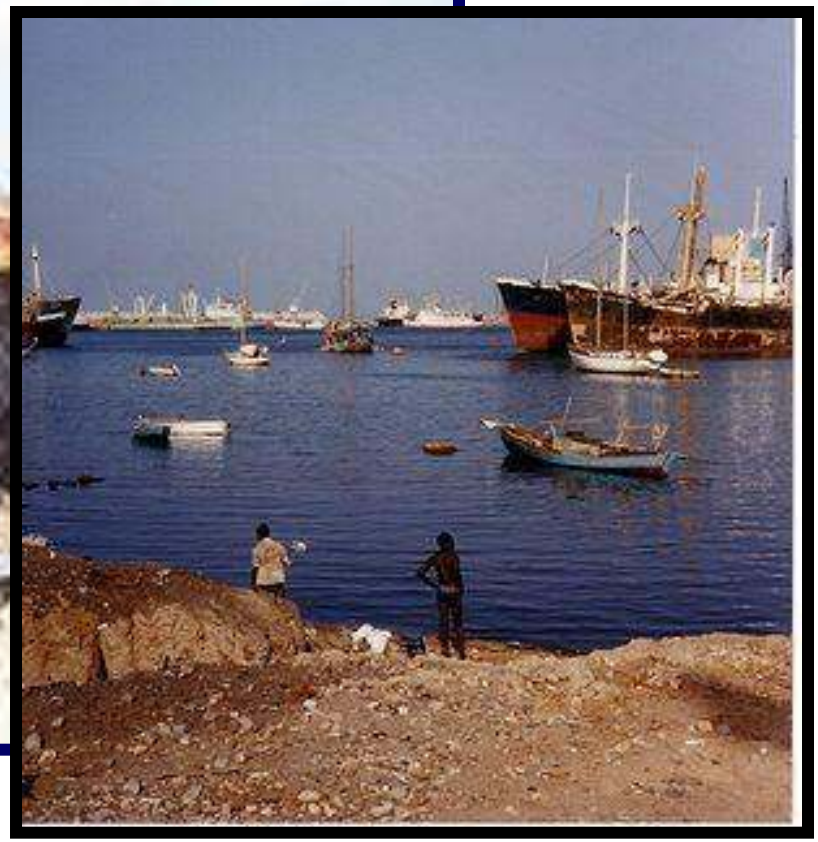
Globalization and public health, a major issue in a rapidly connected world

I knew cross-border travel was important, but who could have known...



Animal husbandry and trade, Sudan





Routine vaccination of cattle against Rift Valley Fever, East Africa

El Nino-associated flooding, East Africa, 1998

Rift Valley Fever, human infection, Sudan, 1998

Clandestine livsetock trade routes, Sudan and Arabian peninsula

Rift Valley Fever outbreak, animals and humans, 2000

Highly pathogenic H5N1 influenza virus in smuggled Thai eagles, Belgium, 2005

Source: Van Borm, et al, Emerging Infectious Diseases Vol. 11, No. 5, May 2005

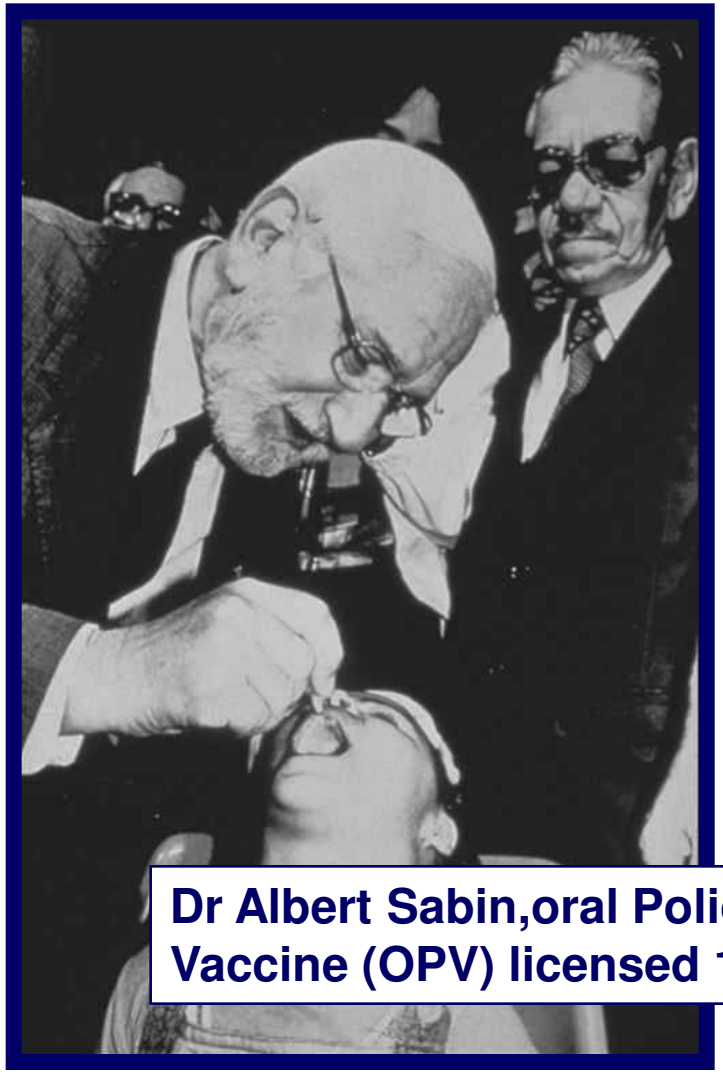
The ingredients: climates snesitive outbreaks such as Rift Valley Fever

- Negligence at animal/human interface

- Effects of climate change

- Clandestine trade

First clinical trails of Sabin attenutated polio vaccine, 1957



Dr Albert Sabin,oral Polio Vaccine (OPV) licensed 1962

Vaccine-associated paralytic polio

Polio vaccines--- adverse reac

"Poliomyelitis associated with type-2 polio
Possible transmission from an immu
child" (The Lancet, vol. 1, Mar
month-old boy hospitaliz ever
received any poliovi g a bed with
a cousin, he a liomyelitis from
the cousi ovirus vaccine thirty-
thr ogical investigation revealed a
virus. The patient's history revealed

[Complications of polio vaccination with Sabin
a Sundhedsstyr. 1968 Mar 25;4(25):337-8. Danish. No
act available.PMID: 5758675; UI: 71041766].

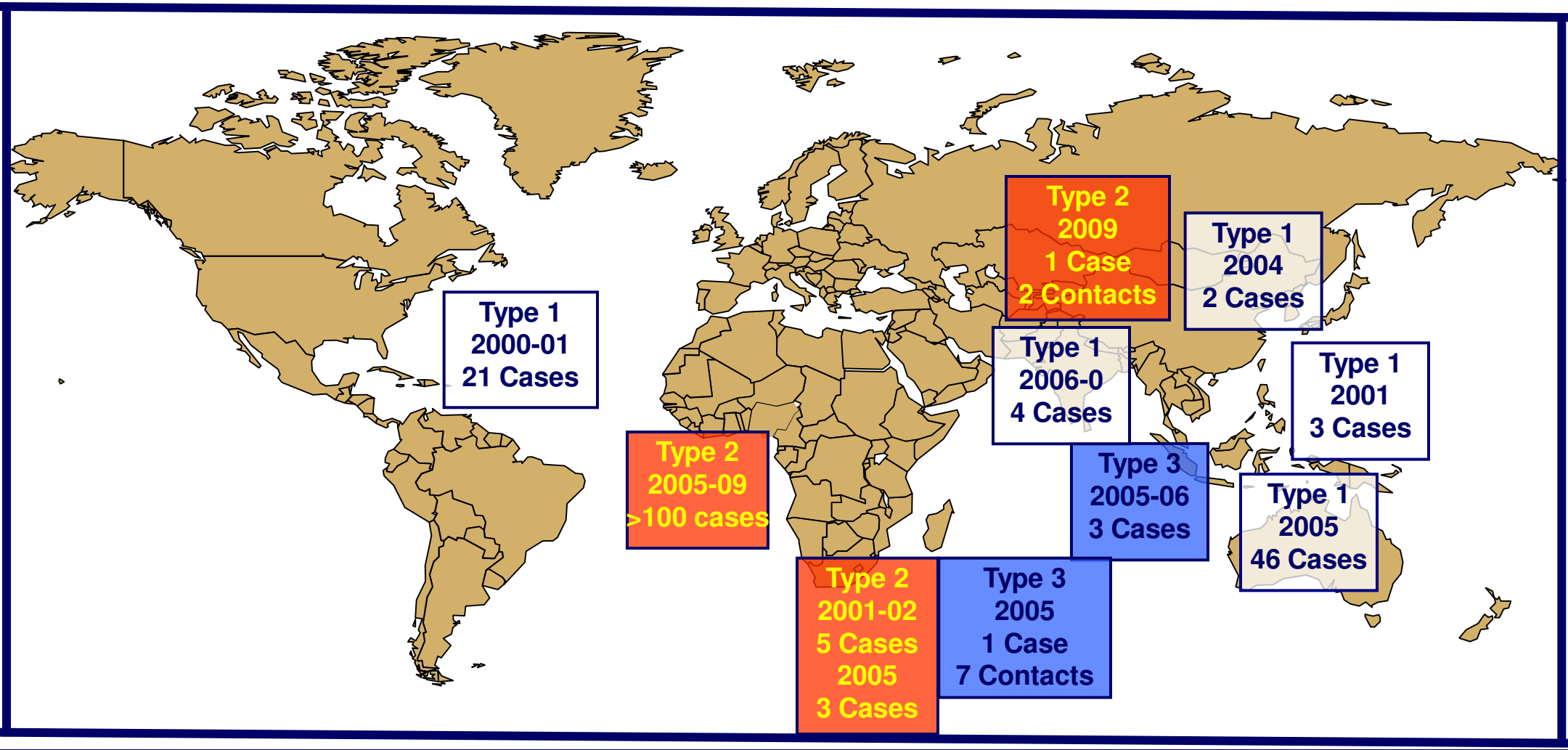
VAPP: paralytic disease occurring in vaccine recipients, or contacts of recipients immunized with OPV

Temporal association with immunization
Type 3 associated mainly with OPV recipients, type 2 associated with contacts
Greatest risk in those receiving first dose of OPV
Generally healthy, very small percentage immunodeficient
Overall risk: 2-4 VAPP cases per million birth cohort (some variation)

Eradication of polio since World Health Assembly Resolution, 1988

- Sabin vaccine selected becausebenefit thought to outweigh the known risks, including VAPP:
  - gut and serum immune response
  - sufficient production capacity
  - inexpensive
- Three WHO regions have now certified that transmission of wild poliovirus has been achieved
- Type 2 virus last isolate from child with paralysis in 1999

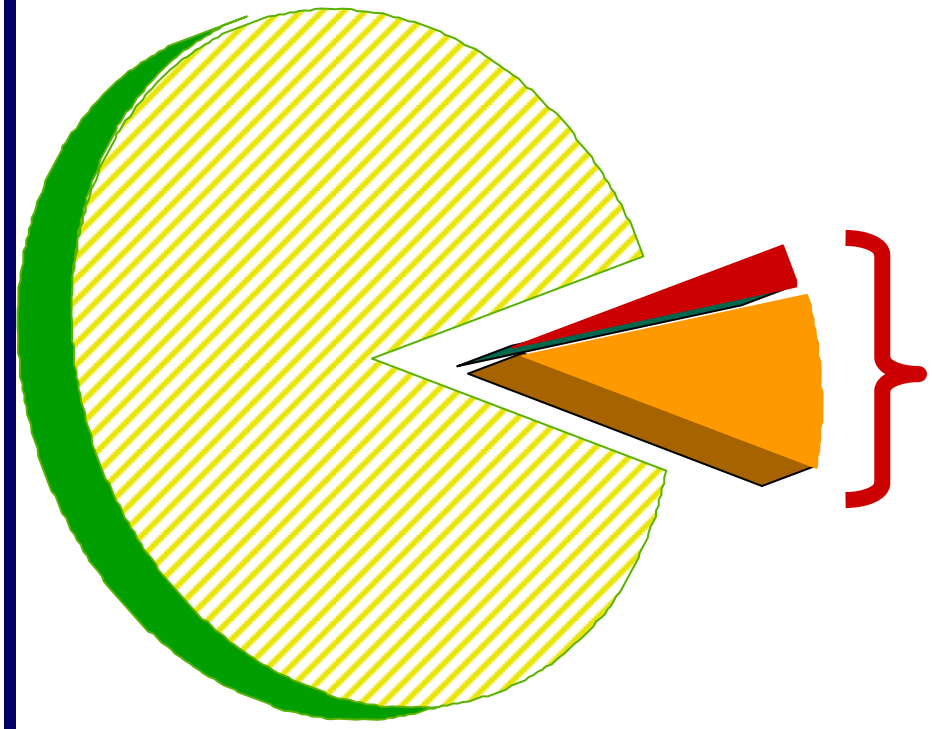
Circulating Vaccine-Derived Poliovirus (cVDPVs), 2000-2009



Circulating vaccine derived polio virus (cVDPV): definition

- cVDPV; >1% difference from parent OPV strains by full VP1 sequence, found by AFP surveillance (from >1 AFP cases)
  - consistent with an extensive period of virus excretion or transmission
- Major risk to eradication once transmission of wild poliovirus has been interrupted worldwide
- OPV be stopped at some time after eradication is certified

Research and development: 90/10 gap



10%

health research by both public and private sectors devoted to health problems in developing countries

90%

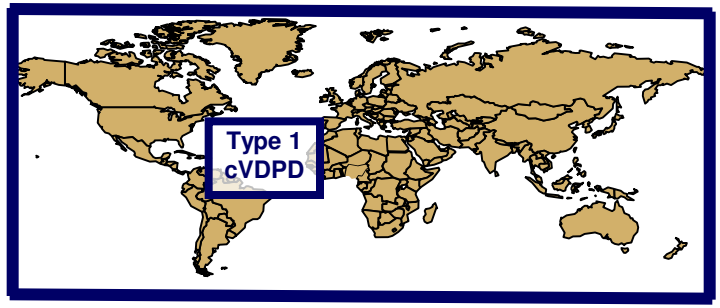
devoted to industrialized country health problems

Source: Global Forum for Health Research:
Initiative on public-private partnerships for health

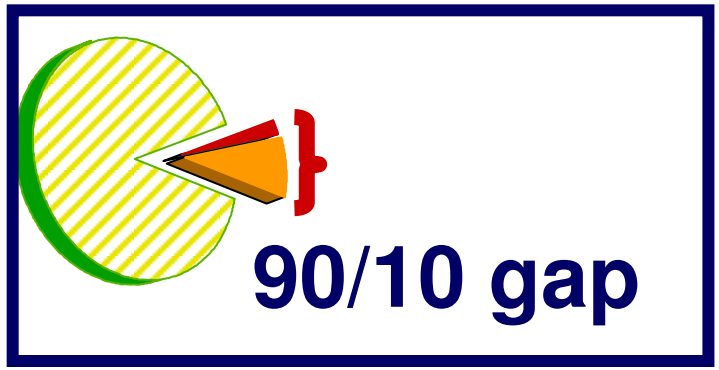
The ingredients: new vaccines and interventions such as oral polio vaccine

- New interventions developed

- Risks not understood at time of licensing



- Limited investment in research and development



The final ingredient: more equitable access to medicines and vaccines

Minister of Health, Indonesia and H5N1 virus sharing: more equitable benefits

The ingredients will never lack

Emerging and re-emerging infections, 1996 – 2009